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## The Production, Purchase and Processing of Milk in Bosnia and Herzegovina

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### Abstract

The aim of this research was to determine the actual data available to the dairies and to compare them with the statistical data. The actual data obtained from dairy can be used for further research and development of the dairy sector. Dominant production system in BiH are small farms (3–5 cows) dealing with mixed livestock production, with the primary goal of self-sufficiency of which only 3.5% are farms with more than 20 dairy cows. The data used in the paper were derived from statistical agencies, as well as own research in the 7 largest milk processors in B&H (purchase about 86.10% of total milk in B&H). The number of dairy farmers of these 7 largest milk producers was 9.865 in 2015 (and 15.311 in 2012), who owned a total of 49.865 dairy cows in 2015 (42.364 in 2012). Average per producers of raw milk was 5.05 cows in 2015 (or 2.77 cow per producer in 2012). Average milk production per dairy cow was 4.149 L in 2015 (and 4.026 L in 2012). E-class quality of milk is only 77% from the deliverables milk and 68% from the number of samples.

*Key words:* cow, producer, quality

### Introduction

The total level of development of agricultural production of a country depends on the participation of livestock production in the production structure of agriculture.

Within livestock production milk production in Bosnia-Herzegovina is one of the most important agricultural industries. Cattle production is the most significant sector of livestock production and is one of the most important branches of the agricultural production. In addition to the system of cattle production providing important products (milk and meat), its importance is especially accentuated due to complementarity with crop production.

Participation of a livestock production in the value of total agricultural production is about 40%. The main problems facing the livestock and animal production in Bosnia and Herzegovina are small production, excessive imports, and unfavorable structure of production, low purchasing prices of milk and very low standard manufacturers who are on the edge of existence. The need to develop, imposes farm enlargement and construction of new, modern dairy farms. In order to increase milk production on farms a substantial capital is required. If an increase in holdings is dependent on the financial success of the farms and on private investment with the current conditions, milk production will continue to decline. While state policy is ineffective, no action of economic principles can be expected to encourage an increase in milk production. Dominant production system are small farms (up to 5 cows) engaged in mixed livestock production, with the primary aim of satisfying their own needs.

The conditions for livestock production, from the standpoint of ensuring the volume and quality of animal feed are favorable. Changes in the structure of sowing areas and higher yields, can provide higher forage crops. In the production of forage and concentrated feed, positive changes can be achieved that provide a solid foundation for the growth of livestock production.

Influence factors on milk productions are agro-climatic, the level of economic development, and religious structure of the population and the traditional aspect of the habit of consuming milk and dairy products. Production technology depends on the level of productivity, quality and profitability of cow's milk production.

Bosnia and Herzegovina is one of the few European countries, which, despite favorable conditions for cattle raising, does not produce enough milk for their needs. Characteristics of the production of milk in Bosnia and Herzegovina can be linked to the conclusion of the milk production in Croatia - Most economies functioning as acquired social category and not the business system, cattle breeding is a tradition, a way of life, and less a business activity. The obvious is the low efficiency of the production potential of the throat, mostly due to inappropriate feeding and accommodation. The selection of the breed as the means of production is not molded and is not suitable to possible intensity of production (Caput, 2003).

Animal nutrition has a major impact on the profitability of family farms with dairy cows. As in the production of milk-specific cost structure, which may be different for each end of the system of production, in the orientation of their structure costs (Caput, 1996) the largest amount represents the cost of feed, which ranges between 45 and 60% of total costs.

Under normal operating conditions the cost of feeding the production cost of 1 kg of milk amount to 50-55%, which means that reducing the cost of feeding can significantly improve the economics of milk production (Uremović, 2004).

Analysis of the economic success of the farm show that sufficiently large income can create only high-production cows on large-enough farms (Conrado et al., 1993). In order for beef production to become competitive on the open market and fully meet the domestic demand for milk and meat, it is necessary to establish new cattle production systems to its size production units, production levels and to apply technological process to handle the production systems of other developed countries livestock.

The process of reducing production capacity in cattle opens pronounced production specialization producers and the production of milk and cattle fattening. Despite the large decrease in the number of cows, compared to the period before the war revives the production of cow's milk and is based on certain intensification of production and a higher annual production per cow.

Also it should be pointed out that the processing capacities of the dairy industry in BiH are mostly owned by multinational companies that follow European and world trends in milk prices. The purchase price of milk in Bosnia and Herzegovina generally follows changes in prices on the EU market. It is also significant that almost all dairy in Bosnia and Herzegovina determined the milk price based on the content of fat and protein and of milk quality class in accordance with the rules on the quality of raw milk.

During 2015, the European Commission confirmed that the control system of food safety in B&H, established in accordance with EU requirements, was operational and efficient, which created conditions for the export of dairy products to the European market, and placed B&H on the list of countries allowed to export milk and milk products to the European market.

## Materials and Methods

Based on available statistical data and calculation, the paper shows the number of dairy cows and the basis for the production of milk in the period from 2002 to 2015 in the Federation, the Republic of Srpska and Agency for Statistics of Bosnia and Herzegovina.

Then the scale of milk production and milk yield per cow, the milk purchase analysis, and the number of milk producers with the average production per producer from 2012 to 2015.

For this survey, data from 7 biggest dairies in BiH was used (Mljekoprodukt, Milkos, Inmer, Zott SEE, Meggle, Padjeni, Eko Sir Pudja), which buy 86.10% of the total purchase milk in BiH. Data on quality of fresh raw milk was obtained from four laboratories performing analysis of raw milk. Based on collected data by dairies the average production of milk per cow was calculated, as well as the quantity of milk delivered per producer and the average number of cows per farm.

## Results and Discussion

Tab. 1. Number of milking cows, milk production per cow per year and total milk production

*Број музних крава, годишња производња млијека по крави и укупна производња млијека*

Year <i>Год.</i>	Federation of B&H <i>Федерација БиХ</i>			Republic of Srpska <i>Република Српска</i>		
	No. of cows <i>Број крава</i>	Milk per cow (L) <i>Млијека по крави (L)</i>	Total milk in L <i>Ук. производња у L</i>	No. of cows <i>Број крава</i>	Milk per cow (L) <i>Млијека по крави (L)</i>	Total milk in L <i>Ук. производња у L</i>
2002	142.000	1.889	267.520	143.000	2.000	286.000
2003	153.000	1.882	278.771	131.000	2.100	275.229
2004	157.000	1.900	299.135	137.000	2.000	273.938
2005	157.000	1.947	304.895	141.000	2.232	315.029
2006	158.000	1.969	312.062	150.000	2.270	340.823
2007	150.000	2.088	313.330	145.000	2.770	401.121
2008	155.000	2.143	322.221	157.000	2.580	405.100
2009	154.000	2.163	321.096	146.000	2.800	405.183
2010	145.555	2.178	316.997	124.000	2.969	368.161
2011	140.555	2.251	315.281	120.000	2.874	344.927
2012	137.910	2.315	319.260	110.000	2.968	326.492
2013	135.785	2.433	330.387	109.000	3.021	329.285
2014	135.233	2.577	348.549	108.000	2.938	317.359
2015	135.710	2.587	351.144	108.000	2.932	316.688
1990 B&H	No. of cows <i>Број крава</i>		Milk per cow (L) <i>Млијека по крави (L)</i>		Total milk in L <i>Ук. производња у L</i>	
	623.000		1.410		875.000	

Source: FBiH Institute of Statistics, RS Institute of Statistics

According to the statistics, there has been an increase in the number of dairy cows. The largest number of dairy cows in BiH was registered in 2008 (312,000). Since 2008 the number of dairy cows has been decreasing.

With the fall of the number of dairy cows increases the production per cow. Therefore, in 2002 the production per dairy cow was 1.942 liters in BiH (F BiH - 1889, RS – 2.000 liters per dairy cow), and in 2015 production per dairy cow was 2.740 liters (F BiH - 2587, RS - 2,932 lit.).

Tab. 2. Information from 7 biggest dairies in BiH 2012 (Source: Survey Dairy)

*Подаци из седам највећих мљекара у БиХ у 2012. години*

Data from dairy / <i>Подаци из мљекаре</i>	2012	2013	2014	2015
Number of milking cows / <i>Број музних крава</i>	42.364	44.092	49.735	49.865
Average milk production per cow (L) / <i>Просјечна производња млијека по крави (L)</i>	4.026	4.014	4.133	4.149
Average cows per producer / <i>Просјечно крава по произвођачу</i>	2.77	3.5	4.76	5.05
Number of milk producers / <i>Број произвођача млијека</i>	15.311	12.607	10.441	9.865
Average delivered milk amount per producer / <i>Просјек испоручене количине млијека по произвођачу (L/год)</i>	11.292	14.040	19.687	20.969

*Source: Survey Dairy – own research*

Based on the data obtained from our own research, the survey of seven largest dairy in B&H, which purchase 86% of the total milk purchased in B&H, the data are quite different compared to the statistical data. Thus, the milk production per dairy cow is 4.026 liter (2012) increase on the 4.149 liter per cow (2015) and it is significantly higher than the average of the total number of dairy cows in B&H based on statistical data.

According to the research of the Expert Centre for farm management and transfer of knowledge and the Institute of Animal Science at the Research Center of Wageningen in Netherlands (Grip, 2003), the order of importance in the management of the farm is next (score of 1.0 is the most important in the management, while the rating of at least 10 significant): Most important is feeding (3.1), Farm economy (3.5), Grassland administration (3.8), Animal health (3.9), Milking (5.1), Minerals management (6.0), Offspring breeding (6.3), Labor organization (6.8), Breeding and selection (7.1), Machinery (9. 2).

The main causes of low milk production per dairy cow in BiH are: genetics, nutrition, accommodation, payback, registers, small farms and a lack of professional advisory services.

The production of dairy cow milk in BiH is very low, if compared with the average of EU and US countries (Fig.1.)

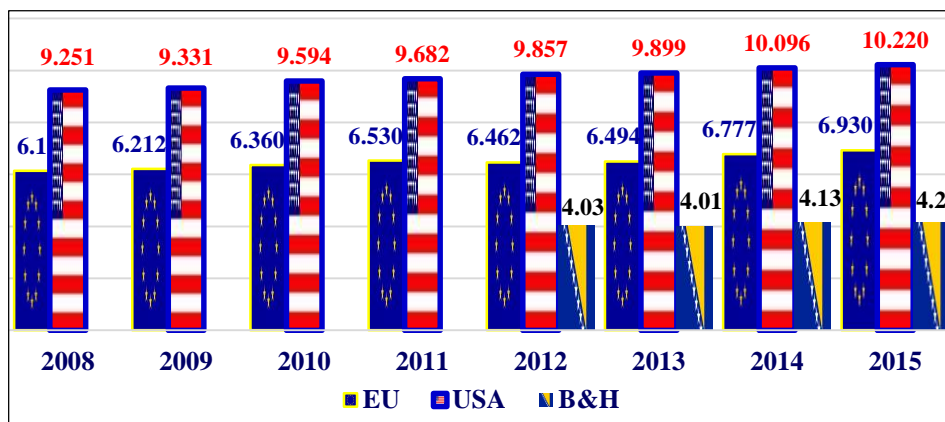


Fig. 1. The average milk production per cow  
*Просјечна производња млијека по крави*  
 (Source: CLAL It., Survey 7 largest dairy - own research)

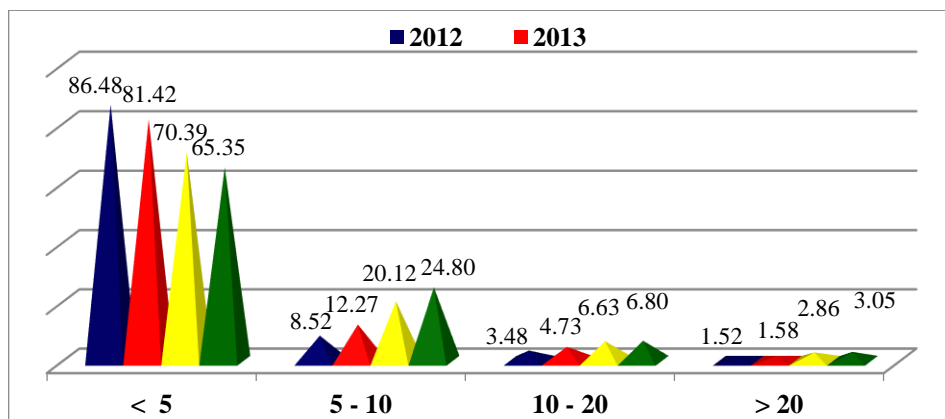


Fig. 2. The size of farms with the number of dairy cows in %  
*Величина фарми са бројем музих крава у %*

The chart shows that small farms, which have up to 5 dairy cows in the herd are the most numerous. However, a large drop in the number of small farms from 86.48% in (2012) to 65.35% in (2015) is still notable. The highest growth have farms that have 5-10 milk cows, from 8.52% (2012) to 24.80% (2015). A very small number of farms has more than 20 dairy cows in the herd, 3.05% (2015).

This trend of increasing farm size is normal, and is currently going on in other EU countries. The trend is to reduce the number of milk producers but to increase milk production per manufacturer.

Tab. 3. The purchase of raw milk (L)  
*Куповина сировог млијека (L)*

Year <i>Год.</i>	Federation B&H <i>Федерација БиХ</i>	Republic of Srpska <i>Република Српска</i>
2010	88.306.464	75.080.400
2011	88.674.125	75.076.810
2012	100.579.225	83.876.560
2013	130.469.900	84.938.500
2014	142.673.100	88.507.800
2014	158.429.400	81.679.300

*Source: FBiH Institute of Statistics, RS Institute of Statistics*

Milk purchase in the Republic of Srpska is slightly decreasing while in the Federation purchase of milk had a constant increase in the last five years. Included in organizing the purchase of milk production in BiH were:

- Dairies, through its own service for the development of raw material base,
- Various forms of associations of milk producers (cooperatives, associations, etc.)
- Private entrepreneurs.

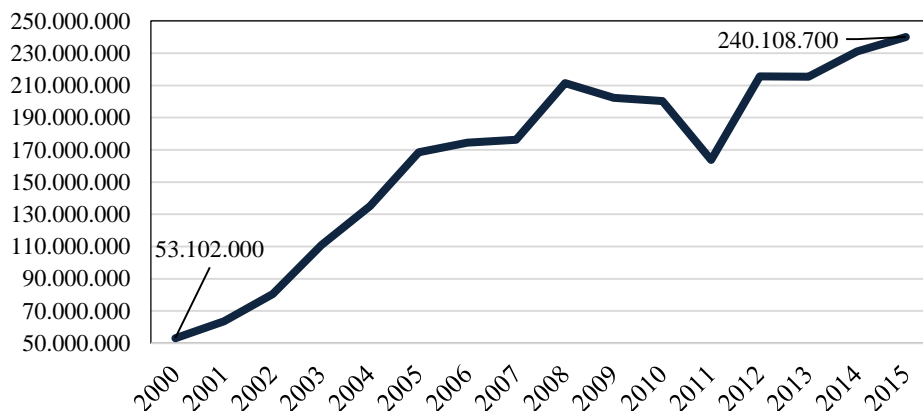


Fig. 3. The purchase of raw milk in the B&H (L)  
*Куповина сировог млијека у БиХ (L)*  
*(Source: FBiH Institute of Statistics, RS Institute of Statistics)*

Currently in Bosnia and Herzegovina there are four laboratories for the analysis of raw milk: Veterinary Institute of the Republic of Srpska "Dr. Vaso Butozan "Banja Luka, Veterinary Institute Tuzla Canton Tuzla, Veterinary Institute Bihać and Federal Institute of Agriculture in Sarajevo.

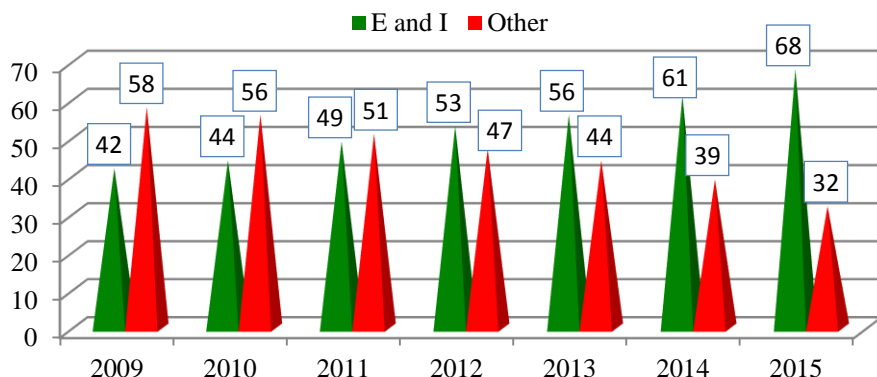


Fig. 4. The quality of raw milk - the number of milk producers  
*Квалитет сировог млијека – број произвођача млијека*

According to the laboratory for quality control of raw milk in 2015 in classes E and I, there was 71% of purchased milk. Compared with data from previous years that's a major increase in the quality of milk in the E and I class. This increase is a result of the application of the Rules on the quality of raw milk, where parameters used for determining the price of milk are the contents of somatic cells and microorganisms. The impact of the increase in the quality of milk were also intensive trainings for producers of raw milk.

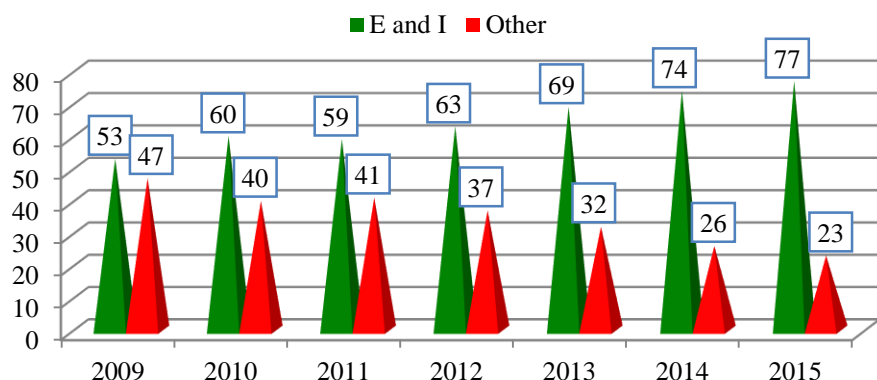


Fig. 5. The quality of raw milk - delivered milk  
*Квалитет сировог млијека – испоручене количине*



According to available data in Bosnia and Herzegovina in 2013 there were 36 registered entities dealing with the processing of raw milk.

Tab. 4. Production of dairy products

*Продукција млијечних производа*

Product / <i>Производ</i>	2012	2013	2014	2015
Milk / <i>Млијеко</i>	139.573,20	159.508,80	141.236,92	126.359,90
Sour cream and creams / <i>Павлака, врхње, кајмак</i>	16.682,40	18.746,40	20.197,89	23.454,30
Fermented milk products / <i>Ферм. млијечни производи</i>	29.078,40	27.353,40	30.733,26	40.086,30
Butter / <i>Маслац</i>	397,20	540,00	325,90	389,80
Cow cheese / <i>Крављи сир</i>	5.319,60	5.185,20	5.502,44	6.233,40

*Source: FBiH Institute of Statistics, RS Institute of Statistics*

It is estimated that the total daily processing capacity of raw milk is about 1.6 million liters. Processing capacities are used on average about 50%. Six of the largest refiners of raw milk are three multinational companies (Inner Dukat - Gradačac, Mlijekoprodukt - Kozarska Dubica, Meggle - Bihać) and three domestic companies (Milkos - Sarajevo, MI99 - Gradacac, Pađeni - Bileća). These 6 dairies purchase and process approximately 80% of raw milk.

## Conclusion

The research points to the difference between the data collected from statistical institutes and the actual data collected from dairy cows. This particularly refers to the number of dairy cows and the average production of milk per dairy cow.

Courses of action of agricultural policy for the restructuring of the livestock sector must be: family farms as the central place of production, specialization of production (farm construction and renovation). Aid is vital to commercial farms engaged in livestock production, modernization of production capacities, scientific farming and agro-economic processes, encouraging young family farms (professional training and informing farmers), high utilization of production potential of animals, higher application of knowledge and education of farmers, strengthening the role of farmers in the market of agricultural products, encourage contracting as much as possible large scale production with the food industry, implementation of financial incentives and benefits in agriculture, implementation and selection activities in

livestock, advisory support, increasing the efficiency of operation of administrative and professional services and cooperatives and associations in agriculture, ensure adaptation of agricultural holdings price movements of agricultural and food products on the international market, reduce the negative effects of trade liberalization in accordance with the rules of the European Union and the World Trade Organization.

The program development of milk production in B&H should be based on three categories of producers:

1. Small dairy herd, with an average of 5 dairy cows, have no motive or a precondition for business growth.
2. Modern conventional production systems adapted to small farms with an average of 15-20 dairy cows in the herd. It is estimated that these farms could make an average production of 4500-5000 liters of milk per cow per year.
3. The system of specialized family dairy farms with 40 to 50 cows in the herd. On these farms, the production of 5000-6000 liters of milk per cow per year could be made.
4. The system of large commercial dairy farms (with more than 100 cows in the herd), which could provide more than 6,000 liters of milk per cow per year.

The development of dairy production in Bosnia and Herzegovina in the coming period is possible under the following conditions: provide long-term stimulating purchase price of milk, ensure continuous and affordable sources of credit, the permanent system of incentives and benefits, effective support of professional services (Consulting, Cattle-breeding, Veterinary and Agro economic), making a connection to businesses manufacturing industry and feed industry, establishing links with other related industries, legislation to establish criteria for product quality, especially of breeding cattle and introduce the practice of payments to EU standards, enable competition of domestic and foreign breeding programs and improvement of hygienic conditions on farms.

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## Производња, куповина и прерада млијека у Босни и Херцеговини

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### Сажетак

Циљ овог истраживања је утврдити најновије податке о мљекарској производњи и упоредити их са доступним статистичким подацима. Добијени подаци из мљекара могу се користити у истраживањима и развоју мљекарског сектора. Доминантан систем производње у БиХ су мале фарме (3–5 крава) које се баве мјешовитом сточном производњом, са примарним циљем задовољења властитих потреба, од којих су свега 3,5% фарме са више од 20 музних грла. Подаци коришћени у раду су добијени од статистичких агенција, као и сопственог истраживања спроведеног у седам највећих прерађивача млијека у БиХ (који врше откуп око 86,10% укупног млијека у БиХ). Број произвођача млијека поменутих произвођача био је 9.865 у 2015 (и 15.311 у 2012. години), који су у 2015. години имали укупно 49.865 музних грла (42.364 у 2012. години). Просјек за произвођаче сировог млијека био је 5,05 крава у 2015. години (и 2,77 крава у 2012. години). Просјечна производња млијека код музних грла износила је 4.149 L у 2015 (и 4.026 L у 2012. години). Укупно 77% испорученог млијека као и 68% узорака млијека је Е–класе квалитета.

*Кључне ријечи:* музно грло, произвођач, квалитет

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